Courtship and mating behaviour of the Indian soft shell turtle, *Lissemys punctata punctata*

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1. Introduction

Most studies on courtship and mating among turtles relate either to chelydridae (Taylor 1933; Allen and Ncill 1950; Legler 1955), kinosternidae (Carr 1940; Finneran 1948; Mahmoud 1967; Earnst and Barbour 1972), emydidae (Wright 1918; Brumwell 1940; Marchand 1944; Cagle 1950; Carr 1952; Evans 1953; Barton and Price 1955; Legler 1960; Wahlquist 1970), testudinidae (Nichols 1953, 1957; Auffenberg 1966, 1969; Weaver 1970) or to cheloniidae (Hornell 1927; Carr 1952; Wood 1953). Among trionychids, very few studies are available and most of them are from American species of *Trionyx* (Webb 1962; Ernst and Barbour 1972; Collins 1974; Plummer 1977). Nothing is known of courtship and/or mating in any Indian soft-shell turtle. This contribution describes courtship and mating in *Lissemys punctata punctata*, the most common freshwater soft shell turtle of India.

2. Materials and methods

Observations on courtship and mating were made from May to August on 4 females and 3 males of *Lissemys punctata punctata* obtained from Lake Mansar, 65 km in the south-east of Jammu city (J and K State, India) and maintained at the laboratory in rectangular glass aquaria of 40 gallon capacity. Observations were made three days after they were captured and maintained in the laboratory.
The aquaria were filled with 20 cm deep tap water, which was changed every 24 hr. A pinch of salt was added to the aquaria to prevent fungal growth. In captivity, the turtles were fed on a mixed diet of small fishes, frogs, molluscs and aquatic plants. Although, the water temperature of the aquaria could not be maintained, it was about 3–6°C lower than the ambient temperature. During the entire course of investigations the ambient temperature recorded varied between 34–42°C.

The turtles were kept in the same aquaria for 24 complete and 9 incomplete observations. However, to make an accurate study of the procedural details of their courtship and mating, one male (with predilection for greater sexual activity) and one female was isolated from others and kept under observation in a separate aquarium for ten days. This pair was watched and photographed during various acts of sexual behaviour. The turtles studied were sexually mature and in carapace the length along the longest curve varies between 218–286 mm.

3. Observations

The first indication of sexual activity in the members of *Lissemys p. punctata* was noticed during first few days of May, when the surrounding temperature averaged around 36°C and water temperature in the aquaria 25·6°C. An increase in mating activity was observed in June, which tapered off towards the end of July, the hottest month of the year (mean maximum temperature for the month being 42°C; personal observations). Egg laying in *Lissemys p. punctata* occurs in August and terminates towards the middle of October (author's personal field data). Mating attempts by these turtles in wild were, however, noticed during April, but never in captivity.

Sexual behaviour in *Lissemys p. punctata* is divisible into three phases: Courtship, mounting and intromission. All these acts are completed inside water.

3.1. Courtship

During courtship, the male keeps swimming above or around a female with neck and limbs hyperextended (figure 1), periodically stroking the back of the female with its chin. On two occasions, a male was seen to approach as close as 5 to 7 cm from the hind end of a female resting on the bottom of the aquarium, stretch its neck and stroke the top of latter's carapace. An unreceptive female avoids male advances by either withdrawing from the spot of the intrusion to a quieter nook of the aquarium or by viciously biting the introducing male away.

Sexually receptive members, on the other hand, face each other with neck hyperextended and bob their heads in vertical plane, 5–8 times during the phase, each time 3 or 4 bobs. In 30 to 120 sec. the female settles on the substrate, retracts her neck and the male mounts her (figure 2). The entire phase lasts about 5–10 min. Though very brief in its duration (extending maximally for 2 min), this phase was a consistent part of the entire courtship behaviour.

3.2. Mounting

This phase begins with the male adjusting his plastron directly over the carapace of female and gripping her with the help of claws of forefeet (figure 3). The
Figures 1-3. 1. Male with neck extended approaching the female. 2. Male roving about the body of the female. 3. Male adjusting his plastron over the carapace of the female and gripping with fore feet claws.
Figures 4--6. 4. Male with neck extended and arched grasping the female with forefeet and attempting mounting, while still not landed. 5. More posterior position of the male against that of female. 6. Note the use of claws by male in gripping the female, with hindlimbs firmly grounded.
Figures 7-10. 7. Male and female in coitus, note the use of claws by male in gripping the female with hindlimbs off the aquarium bottom. 8. Male curving its neck out of the water, note the hindlimbs firmly grounded. 9. Back to back position prior to termination of act. 10. Close up of the back to back position to show the exact cloacal alignment and the passivity of the male. Note the hindlimbs of male are withdrawn under the femoral valves.
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Male keeps its neck and head extended and the female remains motionless all the time (about 5–6 min) when the male brings his cloaca in apposition with that of the female (figures 4 and 5). During this effort, the male lands its hind feet firmly on the bottom of the aquarium (figure 6).

The mounting phase lasts from 5 min (3 observations) to about an hour (1 observation), 25 min being an average duration (10 observations) of this act. No mounting between the members of the same sex was noticed during the present observation.

3.3. **Intromission**

In the initial phase of intromission the male further adjusts its cloaca in close apposition with that of the female by slipping backwards over the carapace of the female partner, keeping the neck arched and hyperextended (figure 7). Later, the male loops its tail round the tail of the female to affect proper placement of its copulatory organ inside the cloaca of the female. All along, the male keeps the female grasped with the help of claws on the fore-feet. The hind limbs which keep generally lifted off the bottom are now firmly landed. While the female stays practically motionless during this part of phase, the male loosens its grip of the partner and assumes a nearly vertical posture. While in this position the male cranes its neck out of water every 3 to 5 min, each time for 2 to 3 sec to gulp in the air (figure 8). The female in copulo was never observed to undertake this exercise. This act may last for 9 to 20 min.

Towards the end of the copulation, the male dismounts but remains cloacally engaged to the female. In this way the two interlocked *in-coito* pair remain with their face in opposite direction (figures 9 and 10). In this position the female swims about in the aquarium, dragging the male behind her. In three such cloacally locked pairs disengagement was effected in 15 min after the male dismounted, whereas in the fourth pair this was effected in 20 min. Separation of a locked pair was never observed while swimming in water and in all four cases only when they had rested at the bottom, that they got disengaged.

A separate 10 hr observation on mating pair on 23 June 1978, showed that the male mounted the female 5 times, 4 times effecting the intromission. It was also observed that every time freshwater was added to the aquarium, carrying the pair under observation, the courtship activity increased markedly. An interesting incidental observation made was that only the first few of the flashes during photography disturbed the courtship to the point of immediate separation of mating partners.

4. **Discussion**

While biting, sniffing and stroking on the shell and/or limbs during courtship and mating in turtles is known (*Terrapene*, Evans 1953; *Malacocheras*, Loveridge and Williams 1957; *Homopus*, Egli 1962; *Gopherus*, Auffenberg 1966; *Chrysemys*, Davis and Jackson 1970; *Graptemys*, Ernst 1974), the omission of biting habit in *Lissemys p. punctata* as possibly in *Trionyx* also (Plummer 1977) appears significant. Trionychids are softshell turtles and therefore, an injury on their soft skin
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would provide an easily excisable route for any infection. The possibility of infection of wounds through biting cannot be excluded. It may be that in the course of evolution, biting as a habit in courtship among soft shells has been lost so as to reduce susceptibility to a dermal infection.

During courtship and mating, male turtles are reported to keep holding the female with all four limbs (Barton and Price 1955; Ernst and Barbour 1972; Ernst 1974; Lardie 1975). Trionyx is, however, the only turtle which is not known to use all four limbs (Conant 1951; Legler 1955; Plummer 1977) for this act. In view of the present observation on Lissemys p. punctata, which was found to employ only the forelimbs during courtship grasp, it appears that the use of only forelimbs is a feature peculiar to members of the family trionychidae.

Although, only circumstantially evident, the very fact that not even one observation of a male mounting another male was made during the entire observation period, would indicate some sort of involvement of sex recognition among these turtles during the sexual behaviour. Further that the head and neck of the male remains fully extended so as to reach the head of the female which after initial extension is withdrawn, might possibly indicate the involvement of integumentary glands beneath the chin, which are better developed in males than the females of the Lissemys p. punctata (personal observation). These two observations possibly support the theory that the olfaction is used during their courtship as already well-known for some turtles (Mahmoud 1967; Auffenberg 1969; Weaver 1970; Jackson and Davis 1972).

Increased sexual activity upon addition of tap water to the aquarium is a phenomenon already known in turtles (Taylor 1933). Whether greater aeration or reduction of temperature as a consequence of water addition could trigger the sexual activity or heighten it in turtles, is under study.

The back to back posture during mating in Lissemys p. punctata is not known for any turtle and what maintains this posture during mating in Lissemys p. punctata is also being investigated.

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